BELIZE

ANNUAL REPORT

of the

DEPARTMENT OF AGRICULTURE

for the year

1973

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TABLE OF CONTENTS

PART I. - GENERAL REVIEW OF AGRICULTURE

	Page
Weather Conditions	1
Export Crops	1
Food Crops	4
Other Crops	7
Pests and Diseases of Crops	8
Livestock Industry	9

PART II. - WORK OF THE DEPARTMENT OF AGRICULTURE

Policies	11
Crops Research	12
Animal Production and Animal Breeding	13
Animal Health	15
Pasture Research and Development	16
Agricultural Extension	22

ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE

FOR THE YEAR 1973

Part 1: GENERAL REVIEW OF AGRICULTURE

A. Weather Conditions:-

During January and February, the weather was mild with occasional moderate showers of rain. Cold fronts originating on the North American landmass swept across the country during the first two months of the year, accompanied by light rain and overcast skies. Prevailing winds during this period were from the North and North-East.

The weather was generally hot and dry from March to May. Light showers of rain were experienced in mid-March and moderate showers occurred in the Belize district during April. Rainfall at Belize City for April was rather high at 7.95 inches. Heavy showers of rain occurred in some areas towards the end of May.

The rainy season did not descend in some areas as it usually does in June. The pattern of rainfall during the months of June and July was variable with some areas receiving normal amounts of precipitation, while in others, e.g. the Northern districts and the Western part of the Cayo district, an extended dry season was experienced. This extended dry stunted the growth of the main corn crop as well as pasture growth. As a result, cattle farmers in the North found it necessary to use cane tops as a supplementary feed.

Heavy scattered showers and thunder showers were prevalent during the period August to October, and resulted in the flooding of rivers and creeks in the Belize, Stann Creek, and Toledo districts. Flooding of the Sibun River in the Belize district caused waterlogging of vegetable fields. Heavy rains in October disrupted land preparation and field work in most areas of the country. In the Cayo and Toledo districts, heavy showers delayed the harvesting of corn and rice, but were beneficial to pasture growth.

Moderate to heavy showers also fell during the month of November. Nevertheless, rainfall was sufficiently well-distributed so as not to cause interruption of field operations. Light showers occurred in most areas during December, but the weather was mainly dry and favourable to the planting of Red Kidney beans and off-season corn.

As usual, January, February, and December were the coolest months of the year. In December there was a cool period lasting for ten days. The lowest temperature (46°F) was recorded at Cooma Cairn in the Cayo district on January 30th.

During the dry season, day temperatures were generally high but were tempered by the cool Easterly breezes blowing in from the Caribbean Sea. The highest temperature recorded during the year was 104°F at Savannah Forest Station in the Stann Creek District during the month of March.

Monthly rainfall figures recorded at various stations are contained in Appendix Table I of this report. Average monthly maximum and minimum temperatures are set out in Appendix Tables II and III respectively.

B. EXPORT CROPS:-

Sugar Cane

Weather conditions were not particularly favourable for the harvesting of sugar cane during the grinding season which lasted from December, 1972 to July, 1973. There was a stoppage due to heavy rains at the Tower Hill factory towards the end of December, 1972. Deliveries of sugar cane to the factories were also reduced in April and May due to adverse

weather conditions. The grinding season at the Tower Hill factory lasted 179 days and that at the Libertad factory 234 days.

Several other factors contributed to only a modest increase in production over the previous crops. These include factory breakdowns which occurred early and late in the grinding season, excessive froghopper damage during 1972 which retarded the growth of the crop, and delivery of a high proportion of burnt cane to the factories. During 1973, froghopper damage was minimal requiring only a low level of control through the spraying of insecticides.

Total production of sugar for the 1973 season was 70,170 long tons of which 31,390 long tons were produced at Tower Hill and 38,780 long tons at Libertad. Production of molasses amounted to 26,130 long tons - 12,963 long tons at Tower Hill and 13,167 long tons at Libertad. This level of production was achieved from processing 718,230 long tons of cane, giving an average Tons Cane/ Tons Sugar (TC/TS) ratio of 10.24. Comparative production statistics for 1972 and 1973 are given below:-

Table 1. Comparative Sugar Production Statistics, 1972 and 1973

TOWER HILL FACTORY	1973	1972
Tons Cane Ground	335,175	302,786
Tons Sugar Produced	31,390	30,464
Tons Molasses Produced	12,963	11,115
TC/TS ratio	10.68	9.94
LIBERTAD FACTORY		
Tons Cane Ground	383,055	364,868
Tons Sugar Produced	38,780	39,503
Tons Molasses Produced	13,167	13,406
TC/TS ratio	9.88	9.24
TOTALS		
Tons Cane Ground	718,230	667,664
Tons Sugar Produced	70,170	69,967
Tons Molasses Produced	26,130	24,521
TC/TS ratio	10.24	9.54

During 1973, the United States increased Belize's export quota to 37,900 long tons as a result of shortfalls from other suppliers. In 1973, a total of 74,148 long tons of sugar valued at $20.8 million Belize currency were exported. Of this total, 41,648 long tons were exported to the U.S.A., 20,500 long tons to the United Kingdom and 12,000 long tons to Canada. In addition, 24,221 long tons of mloasses worth over $2 million was exported to the United States.

Payments to cane farmers amounted to around $13 million. The final prices paid for cane were $18.73 per ton to Corozal farmers and $17.43 per ton to Orange Walk farmers. In December, the Sugar Board authorised the Cane Farmers' Association to issue licences to its members for the 1973/74 crop. Licences for the 1,216 members of the Corozal division totalled 387,724 tons and those for the 1,077 members of the Orange Walk division amounted to 373,257 tons.

Citrus

A new record production was achieved during the 1972/73 citrus crop which was harvested during the period August, 1972 to June, 1973. Orange production reached an all-time high of 971,137 contract boxes of 90 lb. net each, an increase of 9% over the 1971/72 level of production. Grapefruit production declined slightly over the pervious year - from 421,049 contract boxes of 80 lb. net each in 1971/72 to 390,483 boxes in 1972/73, or by around 7%.

The Mexican fruit fly and Premature Fruit Drop were the major pest and disease affecting the citrus crop respectively. Labour shortages in the Stann Creek valley slowed down the harvesting of the crop. The Citrus Company of Belize (C.C.B) processed 714,366 boxes of fruit or 52% of the crop. While Salada (Belize) processed 647,254 boxes or 48% of the crop.

The acreage under citrus increased to 9,500 acres consisting of 7,000 acres of oranges and 2,500 acres of grapefruit. Several new fields were established in response to the stable prices paid over the last few seasons. The Citrus Company of Belize purchased grapefruit to be exported as fresh fruit to the United Kingdom. Three shipments of fresh fruit were made and an advance price of $1.60 was paid to growers for all grapefruit shipped in the fresh form. Two additional payments amounting to $1.90 per box were also made in respect of the first shipment only.

Both Salada Belize and C.C.B. bought grapefruit for processing into juice, concentrate, and segments. Salada paid growers $1.25 per contract box, while C.C.B. offered an advance price of $1.60 per box. As usual, the prices offered for oranges varied during the season. Salada paid 85 cents per box for early oranges and $1.25 per box for late oranges. C.C.B. paid 75 cents a box for early oranges and $1.25 for mid-season oranges, and $1.10 for late oranges. The total paid out for fruit delivered to the factories was approximately $1.74 million, of which individual growers received $0.72 million and the two Citrus Companies $1.02 million.

The Citrus Growers' Association had a total membership of 270 growers in 1973. Of these, 227 growers delivered oranges and 209 delivered grapefruit to the factories during the year. A cess of 6 cents per contract box of fruit delivered was levied by the Association in order to obtain funds to cover its operational costs.

In addition to exports of fresh grapefruit to the United Kingdom, fresh oranges were expected to Mexico - mainly from the Northern districts. Exports of juices, concentrates, segments as well as small quantities of citrus oil were also made. The total value of all citrus exports was approximately $4.64 million. Details of citrus exports are provided in Table 2 below.

Table 2. Exports of Citrus Products, 1973

Product	Quantity (lb.)	Approximate Value ($)
Fresh Oranges	1,417,500	36,614
Fresh Grapefruit	688,300	73,589
Orange Juice	4,779,400	542,708
Grapefruit Juice	2,733,000	451,218
Orange Concentrate	8,056,500	2,264,191
Grapefruit Concentrate	823,000	438,146
Grapefruit Segments	3,744,100	714,842
Orange oil	309,600	119,446
Grapefruit oil	1,900	1,216
Totals	22,553,300	4,641,970

Honey

Honey production increased 58% over the 1972 level. Total production was 292,458 lb. compared to 184,951 lb. in 1972. Extraction commenced in the Orange Walk district late in 1972, and in the Corozal district in January, 1973. Weather conditions were favourable for honey production in the early part of the year, and bees were able to locate adequate supplies of nectar and pollen from various species of flowering

trees and shrubs. Heavy showers which occurred in May, together with a scarcity of flowering trees slowed down the honey flow during subsequent months. There was no extraction of honey during the period September to November.

During 1973, the number of hives increased by 457 to a total of 3,748 hives. The number of apiaries increased from 154 to 181, and the number of beekeepers from 97 to 115. Honey production is still concentrated in the two Northern districts of Corozal and Orange Walk as can be seen from Table 3 below which shows the distribution of apiaries, hives, beekeepers and production as at 31st December, 1973.

Table 3. Distribution of Honey Production by Districts, 1973

Districts	No. of Apiaries	No. of Hives	No. of Beekeepers	Honey Production 1973
Corozal	51	1,254	28	99,614
Orange Walk	88	1,802	64	167,619
Belize	15	206	8	582
Cayo	22	373	10	20,818
Toledo	5	113	5	3,825
Totals	181	3,748	115	292,458

There were no major outbreaks of pests and diseases during the year. Early in the year, bees were affected by diarrhoea but this was easily controlled by the use of Sulphathiazole and Terramycin. In September, one Orange Walk beekeeper lost 30 hives on account of insecticidal poisoning, while in Corozal 7 hives were similarly lost in December.

Exports in 1973 amounted to 176,300 lb. or 79 long tons. The export price was £325 or $1,300 Belize per long ton F.O.B. Belize port, which is more than double the best price paid in 1971. Provided export prices continue to be renumerative, interest in beekeeping is expected to continue increasing over the next few years. There is significant scope for expansion in the industry, especially in the Southern half of the country.

C. FOOD CROPS:-

Rice

The total acreage cultivated to rice in 1973 was 11,511 acres from which an estimated 16.1 million lb. of rice paddy was harvested. Big Falls Ranch Limited accounted for 60% of the total production from the 6,347 acres of irrigated rice which the Company cultivated in 1973. Table 4 gives the distribution of acreage by district and according to system of production.

Table 4. Rice - Distribution of Production by District, 1973

District	Acres Mechanised	Acres 'Milpa'	Total Acres	Estimated Paddy Production (lb.)
Orange Walk	371	43	414	993,600
Belize*	6,585	354	6,939	10,287,500
Cayo	35	347	382	399,500
Stann Creek	-	44	44	39,600
Toledo	493	3,239	3,732	4,378,600
Totals	7,484	4,027	11,511	16,097,800

* Includes Big Falls Ranch

The acreage under mechanised rice increased in the Orange Walk and Belize districts, but decreased in the Toledo district. In the Belize district Gillette Brothers produced 138 acres of mechanised rice at Burrell Boom, while the Rancho Dolores cooperative cultivated 100 acres. In the Toledo district, individual farmers and rice producers' cooperatives planted only 373 acres of mechanised rice, compared to 872 acres in 1972. The Ministry of Agriculture's pilot project was also reduced from 200 acres in 1972 to 120 acres in 1973. In the Cayo district, the main areas of production were Unitedville, Ontario, Blackman Eddy and Teakettle. There were no rice producers in the Corozal district, and only a small number of 'milperos' produced in the Stann Creek district.

Rice fields in the Toledo district were attacked by the fungus Helminthosporium oryzae and this contributed to a reduction in yields. Weeds and Army worms (Spodoptera frugiperda) were also problems encountered, particularly in mechanised rice fields.

Marketing Board purchases of rice paddy for 1973 amounted to 3,886,394 lb. of which 3,699,880 lb. were purchased from the Toledo district. Big Falls Ranch Limited milled their own rice, while the Mennonites in the Orange Walk district milled most of the rice produced in that district for sale to retail outlets in Corozal Town, Orange Walk Town and Belize City.

Corn

The total area cultivated to corn in 1973 was 24,224 acres of which 10,104 acres were mechanised. Estimated production of dried grain was 35.9 million lb. The Mennonite communities in the Orange Walk and Cayo districts were the main producers, accounting for around 90% of the mechanised acreage. The cultivation of maize is carried out in all districts - mainly under the 'milpa' system in the Belize, Stann Creek and Toledo districts. In the Belize district 100 acres were planted to the hybrid variety Poey T-66. The main improved varieties used are VS-550A (synthetic) and Pioneer X-306. Many 'milperos' used their own local types of seed saved from the previous crop. A breakdown of production by district and system of cultivation is provided in Table 5 below.

Table 5. Corn - Distribution of Production by District, 1973

District	Acres Mechanised	Acres 'Milpa'	Total Acres	Estimated Production (lb.)
Corozal	257	1,802	2,059	3,090,000
Orange Walk	6,455	2,725	9,180	18,358,750
Belize	-	423	423	423,000
Cayo	3,392	3,855	7,247	8,711,500
Stann Creek	-	425	425	425,000
Toledo	-	4,890	4,890	4,890,000
Total	10,104	14,120	24,224	35,898,250

The acreage planted to corn decreased in the Corozal, Orange Walk and Toledo districts. The extended dry season in the Corozal district led to the abandonment of some corn fields which were planted but which reverted to bush before the corn plants germinated. Other farmers had to replant their fields once or twice in order to obtain a good stand of corn. Adverse weather conditions also contributed to low yields among 'milpa' farmers in the Cayo district. The Mennonites at Spanish Lookout, however, obtained good yields from their mechanised corn crop. In the Toledo district, weather conditions during the growing season were favourable but losses were experienced on account of army worm damage and damages to the maturing grains caused by birds and rodents.

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Table 5. Corn - Distribution of Production by District, 1973

District	Acres Mechanised	Acres 'Milpa'	Total Acres	Estimated Production (lb.)
Corozal	297	1,002	2,059	3,090,000
Orange Walk	6,465	2,725	9,180	18,360,750
Belize	-	423	423	423,000
Cayo	3,392	3,855	7,247	8,211,500
Stann Creek	-	425	425	425,000
Toledo	-	4,890	4,890	4,890,000
Total	10,104	14,120	24,224	35,899,250

Red Kidney Beans

The total area cultivated to Red Kidney beans in the 1972/73 crop was 5,610 acres from which an estimated 2.8 million lb. of beans was produced. The Mennonite communities of the Orange Walk and Cayo districts were the main producers. They produce the crop under the mechanised system in a rotation with corn. Average yield was around 500 lb./acre. The distribution of Production by district is given in Table 6.

Table 6. Red Kidney Beans - Distribution of Production by District 1973

District	Acreage Cultivated	Estimated Production (lb.)
Corozal	25	12,500
Orange Walk	2,980	1,490,000
Belize	3	1,500
Cayo	2,350	1,175,000
Stann Creek	11	5,500
Toledo	241	96,000
Totals	5,610	2,780,500

The crop was affected by the dry weather conditions which prevailed in January and February. Difficulties in procuring seed supplies and the high cost of imported seed (80 cents a lb.) were factors limiting increased production of this crop.

Other Pulses

Planting of black beans amounted to 90 acres in the Corozal district and 32 acres in the Toledo district. In the Cayo district, 8 acres of Black, Pinto and other types of red beans were planted. Black beans are consumed mainly by people of Spanish and Maya Indian descent, although in times of shortages of Red Kidney Beans they are accepted by Belizeans of other ethnic groups. On a whole, consumers seem to prefer the red types of beans to Black beans.

Peanuts are normally grown only by the Mennonites. The Mennonites at Blue Creek and Shipyard in the Orange Walk district planted 144 acres in 1973, while those at Pilgrimage Valley and Barton Creek in the Cayo district planted 15 acres. Total area planted to peanuts was, therefore, 159 acres from which an estimated 80,000 lb. of peanuts was harvested.

Root Crops

Root crops such as cassava, sweet potatoes, coco yams, and yams were grown for local consumption mainly on small plots of an acre or less in size or intercropped with corn. Total acreage cultivated to these crops was around 450 acres made up as follows:-

Cassava	175 acres
Coco	125 "
Sweet potatoes	75 "
Yams and Yampie	40 "
Other root crops ...	35 "
Total	450 "

The main areas of production are the Stann Creek and Toledo districts. All root crops are cultivated by traditional methods involving shifting cultivation. Normally, a crop is planted in the dry season of one year to be harvested in the ensuing season. The exception is sweet potatoes

which is planted in September/October of one year and harvested in May/June of the succeeding year.

Plantains and Bananas

The area planted to these two crops in 1973 was 348 acres. Eighty-five acres of plantains and 36 acres of bananas were planted in the Cayo district, while in the Toledo district 89 acres of plantains and 17 acres of bananas were established. All other districts accounted for 171 acres of plantains and bananas.

Vegetables

The supply of vegetables from local production continued to be inadequate to meet the demand, and imports from Guatemala and Mexico were made. Vegetables are produced mainly on small plots of ¼ acre or less in size and it is difficult to assess the overall acreage. It is estimated that around 130 acres of cabbages, tomatoes, and peppers were cultivated in 1973. A fair quantity of pumpkins and squash were also produced during the year.

The Mennonites in the Orange Walk district cultivated 10 acres of Irish potatoes on a trial basis from which 27,000 lb. of potatoes were harvested. Apart from the Mennonite communities, the main producers of vegetables are farmers along the Sibun River in the Belize district and in the Macaw Bank area of the Cayo district.

Figures on imports of vegetables into Belize during the year 1973 are given in Table 7 below.

Table 7. Imports of Vegetables into Belize, 1973

Type	Quantity (lb.)	Approximate Value ($)
Irish potatoes	1,900,000	281,667
Onions	1,064,800	191,156
Tomatoes	1,974,000	62,506
Cabbages	357,000	71,826
Beans, peas, etc.	201,000	56,787
Other fresh vegetables	259,300	67,431
Processed vegetable products	612,400	233,072
Totals	6,368,600	964,445

OTHER CROPS:-

Watermelons

Fifty-five acres of watermelons were cultivated with an estimated yield of 450,000 lb. Thirty-five acres were produced in the Macaw Bank, Pilgrimage Valley and Barton Creek areas of the Cayo district, while the Orange Walk and Belize districts accounted for 10 acres each.

Small plots of watermelons were cultivated in the Cayo district throughout the year, so that watermelons were more or less continuously available. Disease outbreaks (anthracnose) in the Belize and Cayo districts reduced yields.

Papayas

This crop is planted on a commercial scale by the Mennonites of the Orange Walk district only. The dehydrating plant at Blue Creek was not operational during the year, but that at Shipyard processed 1,156,518 lbs. of green papaya into the dehydrated product for shipment

to Canada. Farmers at Blue Creek planted 25 acres and those at Shipyard 70 acres in 1973. Local farmers plant this crop on a limited basis only for sale as fresh fruit on the domestic market.

Grain Sorghum

Three hundred and twenty-one acres of grain sorghum were planted in 1973. The Mennonites of Spanish Lookout planted 190 acres and those of the Orange Walk district 131 acres. Yields were around 2,000 lb. per acre giving an estimated total production of 642,000 lb. The crop is used as a substitute for corn in the compounding of animal feeds. Because of its ability to withstand drought, the crop is becoming increasingly popular in the country and production should continue to increase.

Tobacco

A total of 95 acres of tobacco was planted during the 1972/73 season. Caribbean Tobacco Company planted 75 acres and small farmers of the Cayo district 20 acres. Plantings commenced in December, 1972 and continued into January, 1973. Most farmers have mechanised their tobacco fields, although a few planted by hand. Yields were of the order of 10,000 lb. of green leaves per acre.

Fruit Trees

Considerable amounts of mangoes, avocado pears, cashew, breadfruit, and a variety of other fruits were grown for the domestic market on non-commercial small holdings. The lack of organized production and marketing however, makes it extremely difficult to get reliable estimates of total production of these crops.

The supply of coconuts was adequate to meet the domestic demand for fresh nuts and nuts to be processed into raw coconut oil. Establishment of new coconut groves was undertaken in the Corozal district. The avocado pear crop was a bumper one in 1973.

E. PESTS AND DISEASES OF CROPS:-

Army worm (Spadoptera frugiperda) was the most serious pest on the major food crops in 1973. Control of this pest is difficult as the caterpillars are most abundant during the heavy rainfall period when insecticides are washed off the plants. One mitigating factor is heavy parasitization by a Tachinid and by an Apanteles spp. Snowy egrets also prey on the caterpillars.

Cucumber beetles (Diabrotica spp.) are also serious pests of field crops in Belize. The adults feed on the foliage of the young plants and if not controlled can completely defoliate a field in a few days. These insects are beginning to develop resistance to some of the more commonly used insecticides. The larvae damage the roots of the crops and this is especially so in corn.

Paddy bugs (Normidia ypsilon and N. pictiventris) were serious pests of rice and grain sorghum. These insects suck the sap from immature grains leaving the heads blasted.

The Cabbage Looper (Plusia brassicae) is becoming increasingly important as a crop pest. The insect is a serious pest on cabbage, tobacco, soybeans and red kidney beans. It is resistant to some insecticides although Dipel, Dipterex, and Lannate have been fairly effective. On account of the difficulty in controlling this pest some vegetable growers use dangerous doses of the chlorinated hydrocarbons with subsequent danger to human beings from chemical residues.

Brown leaf spot (Helminthosporium oryzae) is a perennial problem on rice. Some pasture grasses, e.g. Pangola and Carib are also affected by this disease.

Rust (Uromyces phaseoli) is a common problem on R.K. beans. Rust only appears on late-planted beans. Dusting with sulphur at first sign of the disease affords fairly good control.

Bacterial Wilt (Pseudomonas solanacearum) is prevalent among Solanaceous crops. Peppers, tomatoes, and egg plants are the main crops affected. Varieties reputed to be resistant to this disease in other countries are affected when introduced into Belize.

Black rot (Xanthomonas campestris) of cabbage is another soil-borne bacterial disease of importance. The bald-head type of cabbage shows some resistance to the disease.

The incidence of Bean Mosaic virus was very high in 1973. This disease is seed-borne and is perpetuated by the continuous use of seed from one year's harvest for planting the next season.

A glossary of the pests and diseases affecting the major crops grown in Belize is contained in Appendix 1 to this report.

F. LIVESTOCK INDUSTRY

Cattle

The national cattle herd was comprised of around 44,700 head of cattle at the end of 1973. This represents an increase of 6,300 head or 16% over the 1970 figure. The cattle herd has, therefore, been growing at an average annual rate of just over 5 per cent during the past three years.

Emphasis continues to be mainly on beef production, and the dairy industry is as yet in its infant stages. The Belize Meat Packers abattoir continued to operate during the year. Final U.S.D.A. certification was obtained in February, enabling exports of beef to the United States. Exports of fresh beef amounted to 508,600 lb. valued at over $\frac{1}{2}$ million Belize currency. The development of an export market for beef is considered crucial to the continued growth of the beef cattle industry, as the small domestic market for fresh beef is already being met from local production. A breakdown of the number of cattle slaughtered and production of dressed beef is contained in Appendix Table IV of this report.

Most of the fresh milk produced in Belize comes from Spanish Lookout in the Cayo district. Western Dairies Limited of Spanish Lookout continued to supply pasteurised milk to consumers in Belize City and Belmopan. No processing of dairy products on a commercial scale is carried out in Belize. There is tremendous scope for expansion of the dairy industry in order to displace the $4.9 million worth of dairy products imported in 1973. Given the country's natural resource endowments, there is no reason why an appreciable portion of the total national requirement for dairy products should not eventually be met from local production. Substantial amounts of capital will be required, as well as total commitment on the part of prospective dairy farmers to the vigorous routine of work which is an integral part of dairy farming.

Imports of dairy products in 1973 were as follows:-

Table 8. Imports of Dairy Products, 1973

Product	Volume (lb.)	Value ($) BZE.)
Milk and Cream, fresh	60,000	14,011
Milk and Cream, Evaporated and Condensed	5,008,400	2,008,252
Milk and Cream, powdered	810,800	845,785
Butter	703,500	852,065
Cheese	1,124,600	1,116,761
Total	7,707,300	4,936,874

The carrying capacity of pastures declined from March onwards with the onset of the long dry season. Loss of body weight during the dry season was experienced in most cattle herds, as cattle farmers have not established sufficient improved pasture to maintain their cattle during this period of the year. Cattle rearers in the Northern districts had access to suplementary feed in the form of cane tops and chopped cane. Expansion occurred in the Patchakan and Chan Chen areas of the Corozal district as land was allocated for the establishment of pastures. The demand for breeding stock was strong during the latter half of the year, and improved breeds were supplied to cattle farmers from the Government livestock stations.

Pigs

The pig population at the end of 1973 numbered 17,200. The country was more or less self-sufficient in fresh pork and 3,529 pigs were exported to Mexico during the year. A total of 9,495 pigs were slaughtered yielding a total dressed weight of 655,740 lb. (see Appendix Table IV for a breakdown by district). The export of pigs was limited to animals of over 225 lb. liveweight as these heavier animals are not in demand on the domestic market.

With few exceptions, pig production is confined to back-yard type operations where the standard of management is extremely low. Lack of adequate numbers of quality breeding stock and the escalating costs of concentrated feeds are major factors inhibiting the expansion of commercial-scale production. The main improved breeds used in Belize are the Large White, Hampshire and Duroc Jersey. Government livestock stations were unable to cope with the demand for these breeds of pigs on account of the small size of the Government pig herd. The price of feed increased from $18.80 to $23.15 per 100 lb. (48% protein), during the course of the year. One pig rearer in the Belize district with a herd of around 300 pigs got around the problem of high feed costs by feeding brewers' waste and poultry entrails from a nearby brewery and poultry processing plant respectively.

Practically all processed pork products such as hams, bacons, sausages, pigtails and lard (rendered pig fat) are imported. There is considerable scope for expansion of production for import displacement - an estimated annual off-take of 20,000 head is needed to meet the domestic demand for fresh pork and processed pork products.

Poultry

The Mennonite communities continued to be the main commercial producers of poultry meat and eggs. Backyard-type poultry operators with flocks of a dozen hens or so are a feature of most villages throughout the country. The increasing cost and irregular supply of feed forced many of the smaller commercial producers out of business in the Cayo district. Two commercial operations got underway in Belize district during 1973. Maya Broilers Limited began producing dressed birds in April and produced around 30,000 birds during the year in seven batches. Nava's Sanichick commenced operations in February, producing an average of 900 - 1,000 birds per week. Maya Broilers also hatched 10,000 day-old chicks of the breeds Golden Comet, Sex-Linked, and Hubbard for their own use and for sale to other poultry producers in the Belize district.

The long-awaited Northern districts poultry processing plant did not materialise in 1973. At first, the problem was a difference of opinion between Corozal and Orange Walk producers as to the siting of the plant. After this conflict was resolved and a site at Trial Farm in the Orange Walk district cleared, the increasing cost of feed forced many of the producers out of business and work on the erection of the plant did not commence.

Production of poultry meat in 1973 was estimated at 2.5 million lb. A further 555,400 lb. was imported, bringing the total estimated consumption of poultry meat in Belize to just over 3 million lb.

The country is rapidly approaching self-sufficiency in poultry meat and was more or less self-sufficient in table eggs, the only importation being of hatching eggs of which 102,000 dozens were imported in 1973 at a cost of $101,690 Belize dollars.

Sheep and Goats

Sheep and goats continued to play only a minor role in the livestock industry. A strong demand exists for these classes of livestock to be 'barbecued', but the demand is far from being satisfied. Only small numbers of sheep and goats are reared in Belize - about 2,700 sheep and 800 goats in 1973. Twenty-five (25) head of sheep were slaughtered in the San Ignacio slaughterhouse in 1973. Of course, a very high proportion of the total slaughterings takes place on-farm.

Animal Health

The major animal health problems encountered during the year involved an outbreak of Blackleg in cattle early in the year and of Vesicular Stomatitis towards the end of the year. The outbreak of Blackleg was controlled within a few weeks after it commenced. Some 14,000 cattle were vaccinated against the disease.

The outbreak of Vesicular Stomatitis occurred in the Cayo district in November. During the period November 28th to December 30th, 253 cattle, 61 horses, and 1 pig were affected by the New Jersey strain of Vesicular Stomatitis. The last infected animal recovered on December 30th, and the quarantine on the affected area lifted on 21st January, 1974. The outbreak of Vesicular Stomatitis was the biggest recorded in the country and occurred in an area where over 50% of the national cattle herd is concentrated.

There were no cases of Rabies or Hog Cholera in 1973. Ten head of cattle were affected by photosensitization on account of eating Lantana Camara in pastures. Cattle were also affected by plant poisoning following ingestion of the species Asclepias curassavica L. and Senecio sp. All cattle so affected recovered except a few which, from post mortem examination, are believed to have succumbed to Senecio sp. poisoning.

Young cattle which were grazed on land previously used for vegetable production in the Belize district were lost through a peculiar wasting condition. It was suspected that residues of chemicals absorbed by the grass were affecting the utilisation of vitamins by the young animals. The problem was subsequently brought under control by treating young stock with vitamin B-12 at weaning.

PART II. WORK OF THE DEPARTMENT OF AGRICULTURE

A. POLICIES:-

The basic policies of the Department of Agriculture remained the same, viz:-

(1) Conducting adaptive research on crops and livestock of economic importance;

(2) Disseminating the results of research efforts to farmers through the extension services;

(3) Encouraging farmers to adopt modern techniques of production so as to increase their output and to use improved varieties of crops and improved breeds of livestock;

(4) Promoting mechanised farming by the provision of mechanical services to farmers at attractive rates, and

(5) Increased production of crops and livestock products so as to achieve self-sufficiency in basic foodstuffs and develop export surpluses of those products in which we have a comparative advantage.

B. CROPS RESEARCH EXTRACTS:-

Soybean Variety Trials

A soybean (Glycine max) variety trial was planted in November, 1972 and harvested in March, 1973. Yields were measured in terms of average seed weight per plant. The highest yielders were ICA Lily and ICA Taroa. This result differs from that obtained in early planted crops where Pelican S.M. Acadian, and Improved Pelican gave the best performances. It would seem that time of planting has a marked effect on the yields of the different soybean varieties.

Soybean Herbicide Trials

An experiment to compare the effectiveness of two herbicides in controlling weeds in the soybean variety Improved Pelican was carried out in 1973. The two herbicides tested were Linuron and Treflan, used singly and in combination. Results indicated that best control was obtained by combining the two herbicides at the rate of 3 lb. Linuron plus one pint Treflan per acre. Yields at this rate of application were double that of the control plots.

In another herbicide trial involving three herbicides, Treflan at 2 gallons per acre gave the best control and this was followed by Amiben at 2 gallons per acre and Linuron at 4 lbs. per acre.

INTSOY Soybean Variety Trial

Twenty varieties of soybean were obtained from INTSOY for trial at Central Farm Experimental Station. Data was collected on yields, pod height, and pod numbers and sent to the University of Illinois in the U.S.A. for statistical analysis. The most promising varieties emerging from the trial were:- Hardee 18, Davis, Hutton, C. Hampton, Jupiter, and Acadian. Only fourteen of the twenty varieties achieved maturity stage under the existing environmental conditions.

Maize - Herbicide Trial

The effectiveness of Atrazine and Sutan separately and in combination in controlling weeds in a VS-550A synthetic corn crop was tested at Central Farm in early 1973. Highest yeild, measured in terms of ear weight per plant, was achieved from a combination of 2 lb. of Atrazine plus 1 pint of Sutan per acre. High rates of application of these chemicals resulted in lower yields than those obtained in the control plots.

Maize - ICA Hybrid Variety Trials

Six ICA hybrid varieties of maize were compared with the commercially grown hybrid variety Pioneer X306. Four of the ICA hybrids produced higher yields than Pioneer X306. The ICA hydrids had better husk coverage which is a desirable characteristic in terms of storage capability.

In a later experiment planted during the dry season, the ICA hybrid varieties exhibited very poor growth in comparison to the commercial varieties Poey T-66, Pioneer X-306, and VS550A. Germination was poor for the ICA hybrids, and those plants which emerged were stunted in growth. The ICA hybrids exhibited earlier silking than Pioneer and Poey.

Maize - Semi-Commercial Trial

Three varieties of corn were tested in

a semi-commercial trial in which 3-5 acres of each variety were planted in two replicates. The varieties used were Poey T-66, Poey T-23, and Mixed hite (a synthetic variety). Time to silking was the same for all three varieties, but ear development proceeded fastest in Poey T-23, a white hy rid. The synthetic was the most tolerant to drought during the planting to silking stage as a result of hich it gave higher yields than the hy rid varieties. Ear height (measured from the soil surface to the lowest ear) was 4.5 feet for Mixed White and 2.5 feet for the hybrids. Corresponding plant heights were 7 feet and 6 feet respectively.

Mixed hite yielded 2,880 lb. per acre. Poey T-66 gave 2,400 lb. per acre, and Poey T-23 produced 2,C08 lb. per acre.

Local Maize Improvement Trials

Sixty-three local varieties of maize were grown in 75 foot rows for purposes of observation and selection. Basic characteristics for selection were: stem thickness, ear height, plant height, resistance to lodging resistance to pests and diseases and yields. Twenty-four varieties were selected for further testing. These selected varieties were planted out in three rows of 100 feet for each variety. Final selection will be based on plant height, grain yield, and resistance to pests and diseases.

Corn Production Schemes

Sixty acres of Poey T-66 were planted to be used for livestock feed at Central Farm. An average yield of 3,622 lb. of grain per acre at 15% moisture was obtained from this crop.

Fifteen acres of VS550A synthetic corn were planted for seed selection and an average yield of 2,800 lb. per acre achieved.

Forty acres of corn and ten acres of grain sorghum were planted in late November to be harvested in March, 1974.

D. ANIMAL PRODUCTION AND ANIMAL BREEDING

The Government Station at Central Farm had a total of 1,400 head of cattle, and this led to overstocking of the available pastures. As a result, a cattle auction was held and 260 head of cattle sold for a total revenue of $21,800.00. Between April and May 12 adult cattle were lost on account of photosensitisation and weed poisoning. Anaplasmosis and Pyroplasmosis were evident especially in the Hereford herd. Sales of cattle from the Government herds at Central Farm were as follows:-

Table 9. Sales of Cattle From Government Herds, 1973

Breed	No. of Bulls	No. of Cows	No. of Heifers	No. of Young Bulls	No. of Male Calves	No. of Calves
Pure Brahman	1	5	18	21	1	1
Costa Rican Brahman	-	43	194	115	8	6
Red Poll	-	8	29	22	1	1
Brown Swiss Crosses	-	1	10	6	1	-
Hereford	-	4	1	1	-	-
Jamaica Black	2	2	2	14	-	1
Brown Swiss	1	5	1	6	4	2
Totals	4	68	255	185	15	11

The Artificial Insemination programme got underway at Central Farm during 1973, and by year's end 35 A.I. calves of different breeds had been produced. Pregnancy tests indicated conception rates of 59% and

78% respectively for Brahman and Red Poll cattle which were artificially bred. Conception rates were low, but this can be attributed to the novelty of the programme and the nervous temperament of the cattle.

Pure Bred Brahman

The size of the Pure Bred Brahman herd was slightly reduced as a result of increased sales of heifers, bulls, and culled cows (see Table 9 above). The overall condition of the herd was excellent, and the cattle maintained a good appearance throughout the year. Average birth weights were the lowest of all herds in 1973, but average weaning weights were second highest of all herds (see Appendix V and VI for details). Average daily weight gains were also the second highest, and the breed was surpassed only by the Charolais x Brahman crosses which have done exceptionally well under the environmental conditions at Central Farm. The average daily range for the whole herd was 1.05 lb. and the range of daily weight gain was from 0.87 lb. to 1.2 lb. (See Appendix Tables VII and VIII for details).

Costa Rican Brahman

The Costa Rican Brahman herd had the second lowest average birth weight. Average weaning weight was also slightly lower than that of the Red Poll and Pure Bred Brahman. Nevertheless, the best individual performance at weaning came from Charolais x Brahman cross-bred calves. Average daily weight gains for males and females of this herd were 1.03 lb. and 0.94 lb. respectively. Average daily gain ranged from 0.52 lb. to 1.32 lb. among males and from 0.61 to 1.51 among females (see Appendix Tables IX and X). Birth weights and average daily gains were higher than in 1972. Of the two herds which were used in the A.I. programme, the Red Poll herd exhibited higher conception rates. This breed is very popular among cattle ranchers and the present herd is too small to meet the demand for breeding stock.

Hereford

The Hereford herd gave their poorest performance of all herds during 1973. The breed requires a very high level of management and is not adapted to our climatic conditions. The Livestock Officer (Research) has recommended that the Ministry dispose of this herd on account of:-

(1) Low conception rates, long calving intervals and low birth weights,

(2) Low weaning weights (225 lb. average compared to 400 lb. average for all other breeds),

(3) Slow weight gains,

(4) High susceptibility to heat stress, Anaplasmosis and Pyroplasmosis and internal and external parasites,

(5) High mortality rates; and

(6) High maintenance cost for management, feed and drugs.

Pigs

The pig herd did not perform satisfactorily in many respects. The main problem seems to be the prevalence of Viral Pneumonia in the herd. This can be overcome only by disposal of the present herd, thorpughly disinfecting the pig unit, and leaving it unused for a period of time. The demand for quality breeding stock is very high, and the Ministry of Agriculture is unable to satisfy this demand from its small herd. Importation of a large number of breeding stock to be used as a foundation stock is necessary if the demand is to be met.

In 1973, the crossbred pigs (Hampshire x Duroc and Hampshire x Large White) gave the best performance (see Appendix Tables XII and

XIII.) The overall performance of the pig herd was better than in 1972, but is still unsatisfactory.

Dairy Cattle

During 1973, several heifers and young bulls were sold to farmers for breeding purposes. These animals were grainfed for 4 to 6 months after weaning to compensate for the weight loss experienced when transferred to open range conditions. The entire dairy herd was vaccinated against Blackleg early in the year. Fewer cases of Anaplasmosis and Pyroplasmosis were recorded than in 1972. Nevertheless, internal and external parasitism continued to be a problem in young calves, heifers and bulls. All animals were treated against Coccidia, Nonchs, and Tricherus. The milking herd was sprayed with Neguvon and Asuntol at monthly or forthnightly intervals depending on the level of tick infestation. Three cases of Vesicular Stomatitis occurred towards the end of the year.

The efficiency of the milking machine was impaired by the fluctuation of voltage in the supply of electricity. Most of the mastitis cases recorded were attributed to poor machine milking. The average milk production per cow per day during 1973 was 19.35 lb. compared to 18.50 lb. in 1972. Production ranged from 15 to 31 lb. per cow per day. Production during the months of March and April was higher than for the same period in 1972. This is on account of the fact that the milking herd was fed with a mixture of fresh forage sorghum and molasses during these months.

Most of the dairy cows and heifers were artificially inseminated in 1973. By the end of the year three A.I. calves had been born.

New Livestock Station - Richmond Hill

A new livestock station is being established at Richmond Hill in the Orange Walk district with funds provided by the British Government. During 1973, 357 acres were cleared of which 157 acres have been windrowed. One hundred and fifteen acres of Carib grass were established from cuttings. Planting was mostly done by hand, although 15 acres were mechanically planted. Five (5) acres were set aside and planted with various species of grasses and legumes for the purpose of seed multiplication. It is intended to establish around 500 acres of pastures by the end of 1974 and to transfer part of the Costa Rican cattle herd from Central Farm in order to relieve the stocking pressure there.

E. ANIMAL HEALTH SERVICES

Staff of the Animal Health Section were busy during the year with outbreaks of Vesicular Stomatitis and Blackleg in cattle. Veterinary officers vaccinated a total of 14,000 head of cattle against Blackleg in 1973. Considering the inaccessibility of some farms and the small number of cattle scattered over a wide area, the limited staff was fully occupied during these outbreaks.

On a whole, the number of farm livestock and pets receiving treatment has been increasing steadily over the last few years. This can be interpreted as reflecting the confidence the livestock farmer and the general public has built up in the services being provided. Below is a comparison of clinical cases, vaccinations, and post-mortems for the years 1971 to 1973:

Table 10. Clinical Cases, Vaccinations and Post Mortems, 1971 - 1973

Year	Cattle	Horses	Pigs	Sheep	Dogs	Cats
1971	866	3,268	257	58	44	4
1972	1,591	38	257	110	105	1
1973	16,018	383	587	225	1,034	30

In the above Table, it should be noted that the figure for horses in 1971 was mainly Venezuelan Equine Encephalomyelitis vaccination. The 1973 figure for cattle involved mainly Blackleg vaccinations. Details of clinical cases for 1973 are contained in Appendix Table XIV of this report.

The Veterinary Staff and Public Health Department staff were involved in examining carcases of animals slaughtered in the district towns. Details of the diseases found at meat inspection are contained in Appendix Table XV. It should be noted that the pigs condemned for Tuberculosis as well as the 60 cases of Cysticercosis were from the Toledo district where the animals are reared under range conditions.

F. PASTURE RESEARCH AND DEVELOPMENT

During 1973, the main events were the completion of the first phase of the Pangola Grazing Trial and the renovation of approximately 100 acres of pasture at Central Farm. Work also continued on the Grass Species (Variety) Trials, Grass Species Demonstration Plots, and pasture maintenance and development at Central Farm. Also included in this report is a summary of the results from the Arable-Ley Rotation Trial.

(1) Arable-Ley Rotation Trial:-

Summary

Twelve steers were run on 9.84 acres of pasture consisting of Pangola, Nunbank Buffel, Carib, and Para grasses for a period of 539 days. The following information was obtained from analysing the data on completion of the trial:-

(a) Average daily weight gain was 1.04 lb.
(b) Total beef produced per acre per annum was 465 lb.,
(c) Net profit per steer was $216.48,
(d) Net profit per acre per annum was $178.77.

Introduction and Objectives

The aim of the trial was to determine the economic feasibility of fattening steers on pasture with little or no supplementation. The trial was, therefore, concerned mainly with the subjects of farm management and resource utilisation. Proper pasture management in the form of clipping, fertilizing, rotating and stocking is crucial to the realisation of a satisfactory return from improved pastures. The ability of the rancher/farmer to determine the correct stocking rate and sequence of rotation will, to a large extent, determine not only the immediate returns from his pastures, but also the duration of pasture utilisation.

Materials and Methods

The trial was conducted at Central Farm on Quamina Clay Loam. The experimental area consisted of 9.84 acres divided into 4 paddocks as follows:- Carib and Para grass 2.58 acres; Pangola Grass 2.22 acres; Pangola Grass 2.14 acres; and Nunbank Buffel 2.90 acres. A total of 12 steers were grazed using a 36 day rotation period. Paddocks were grazed for 9 days and rested for 27 days in each rotation.

The twelve steers included 8 Costa Rican Brahmans, 3 Red Polls, and 1 Charbray Cross. All weights were recorded after overnight yarding, as this method tends to minimise variability in weight gain due to body-fill. Initially, weights were taken every forthnight, but later the frequency of weighing was reduced to monthly intervals. Over the experimental period of 539 days a total of 4,774 lb. of fertilizer was applied consisting of 3,974 lb. urea, 550 lb. 10-30-10, and 250 lb. 13-13-21. Pastures were also bush-hogged and steers supplied with mineral salts and a urea-molasses supplement.

Result and Discussion

Table 11 below presents data relating to weight gains in the trial.

Table 11 Arable-Ley Rotation Trial: Weight-Gain Performance of Steers (lb.)

Brand	Weight ✓ on 26.4.72	Weight ✓ on 15.10.73	Total Weight Gained	Average Daily Gain	Weight per day of age	Age (days)
1-54	400	938	538	0.99	0.95	986
1-87	400	988	588	1.09	1.01	977
1-44	409	1,009	600	1.11	1.02	987
1-158	411	935	524	0.97	1.01	918
1-150	415	997	582	1.08	1.07	933
1-86	417	872	455	0.84	0.89	979
1-104	418	1,031	613	1.13	1.07	964
1-143	431	1,026	595	1.10	1.09	937
1-16	435	1,168	733	1.36	1.17	997
1-135	444	908	464	0.86	0.96	939
1-46	433 //	902	469	0.97	0.91	987
1-189	466 //	964	498	1.03	1.11	869
Average	423	978	555	1.04	1.02	956

✓ Weight after overnight yarding
// These two steers were introduced after the trial had begun.

Average daily weight gain was 1.04 lb. and the range in weight gain was from 0.84 lb. to 1.36 lb. In terms of pasture productivity these gains represent 465 lb. of beef per acre per year as compared with 401 lb./acre/annum achieved in 1971 and 375 lb./acre/annum in 1970. Better weight gains would have been achieved if pastures were in better condition. Pasturesin all four blocks were rather sparse, and considerable encroachment of weeds was evident.

The trial has shown the benefits of increasing stocking rate, despite the normal average daily gain per animal that was achieved. It would appear that more attention needs to be given to the productivity of the land (beef per acre) than to individual animal performance in fattening steers on pastures. This does not suggest that individual performance is not important, but rather emphasizes the need for proper stocking rates to avoid undergrazing of available pasture.

The financial aspects of the trial are summarised in Table 12 below. The steers were sold at a 'farm-gate' price of $39 per 100 lb. liveweight. Each steer grossed on average $381.48, and gave a net average profit of $216.48. Each acre of pasture grossed $465.22 and netted $263.99. Net profit per acre per annum was $178.77.

Table 12. Arable-Ley Rotation Trial: Financial Aspects

Revenue		Costs		Profit
Sale of 12 steers	$4,577.82	Purchase of Steers	$1,269.75	
		Fertilizer	317.35	
		Fertilizer application	40.90	
		Bush-hogging	98.20	
		Drenching	22.90	

		Spraying	4.00		
		Minerals	17.20		
		Planting pastures	30.90		
		Labour	178.85		
Total Revenue	$4,577.82	Total cost	$1,980.05	Net Profit	$2,597.77

(2) Pangola Grazing Trial

Summary

A trial was conducted at Central Farm on Quamina Clay Loam to test two grazing systems involving different lengths of rotation using weight gain of steers as the indicator. At the end of the experimental period it was observed that:-

(i) No benefit was derived from using the shorter rotation at the stocking rate used;

(ii) Best performance was obtained from Charbray Crosses and Red Polls;

(iii) Total beef produced per acre/per annum was 576 lb. and 585 lb. for the short and long rotations respectively; and

(iv) Higher stocking rates may yield still greater per acre beef production.

Introduction and Objectives

The aim of the trial was to determine the performance of Pangola grass under two different rotational grazing systems. The reason for undertaking the trial was the need for more accurate data on rotation systems and stocking rates using the various improved pasture grasses grown in Belize. Pangola (Digitaria decumbens) was selected as the first trial grass.

Materials and Methods

The trial was conducted at Central Farm on Quamina Clay Loam. The experimental area consisted of 12 acres divided into two blocks to accomodate the two treatments. Each 6 acre block was further sub-divided to give two treatments: (1) a 40 day rotation, using 5 paddocks with steers remaining 8 days in each paddock; and (ii) a 27 day rotation, using 9 paddocks with steers remaining 3 days in each paddock.

Date of commencement was 5th July, 1972. Eight (8) steers were used in each 6-acre block, these being comprised of 2 Red Polls, 2 Charbray Crosses, and 12 Costa Rican Brahman. Weights were recorded after overnight yarding to minimize variability due to body-fill. Initially, weights were taken forthnightly, but the period between weighings was subsequently increased to one month.

A total of 900 lb. urea fertilizer was applied at a rate of 75 lb. per acre. Water was supplied in half-drums, and no minerals or supplementary feeding provided. Pastures were occasionally bush-hogged.

Results and Discussion

Tables 13 and 14 below present data on total weight gain, age in days at end of the trial, average daily weight gain, and weight per day of age for the two rotational systems.

Table 13. : Pangola Grazing Trial - Performance of Steers in Short Rotation (lb.)

Brand	Weight on 5.7.72	Weight on 17.10.73	Total Weight Gain	Average Daily Gain	Weight Per Day of Age	Age in Days
1-102	479	969	490	1.04	1.00	963
1-82	440	1,018	578	1.23	1.04	973
1-248	417	1,005	588	1.25	1.34	750
1-156	430	1,020	590	1.26	1.10	926
1-63	462	1,100	638	1.36	1.12	982
1-322 ≠	432	1,030	598	1.28	-	-
1.-06	497	961	464	0.99	0.96	1,000
1-204	444	945	501	1.07	1.13	[illegible]
Average	450	1,006	556	1.18	-	

≠ No birth weight was recorded for this steer.

Table 14. : Pangola Grazing Trial - Performance of Steers in Long Rotation (lb.)

Brand	Weight on 5.7.72	Weight on 17.10.73	Total Weight Gain	Average Daily Gain	Weight per day of Age	Age in Days
1-39	478	685	207	1.14	0.97	702
1-207	528	930	402	1.75	1.10	839
1-119	446	903	457	0.97	0.92	983
1-229	367	900	533	1.14	1.14	784
1-90	443	873	430	0.92	0.89	976
1-220	409	990	581	1.24	1.17	835
1-244	346	860	514	1.10	1.13	758
1-252	376	960	584	1.25	1.28	746
1-321 ###	373	1,177	804	1.71	###	###
Average	405	949	538	1.24	-	-

No birth date or weight recorded for this steer.

It should be noted that the Charbray crosses (numbers 1-322 and 1-321) and Red Poll (1-63) performed better than the C.R. Brahman. This result coincides with those from previous trials. Under the management system adopted in the trial, no benefit was derived from using a shorter rotation period. It could be that the stocking rates were too low for the benefits of a shorter rotation to be realised. It was noted that under both systems steers were underutilizing the pasture to the extent that frequent clipping was necessary to remove trampled grass and rank growth.

The figures of 576 lb. and 585 lb. beef produced per acre per annum are the highest recorded in recent grazing trials at Central Farm. This increased production can be attributed mainly to increased stocking density. It is likely that higher production could be achieved by increasing stocking rates still further.

(3) Grass Species Variety Trials

Introduction

The trial involving different species of grass planted at three sites continued in 1973 with all plots being fertilised and cut regularly. The three sites are Central Farm (Cayo District), Hattieville (Belize District), and Yo Creek (Orange Walk District). The trial at Yo Creek was terminated in December, 1973 on account of lack of adequate supervision.

Results and Discussion

At Hattieville, Kazangula Setaria, Hamil grass, and Pangola gave the highest fresh weight yields, as they did in 1972. Two factors are extremely important in pasture management on the pineridge type soils in this area: they are, low soil fertility and poor drainage. Analysis of the soil in the experimental area gave the following results:- PH6.3, %N 0.105, P 3.42ppm, K 20 ppm, and Ca 1,170 ppm. The soil phosphorus is about three times lower than the minimum requirement, while soil potassium is about 6 times lower than the normal value. Nitrogen content is also extremely low. High and frequent application of N.P.K. fertilizer is therefore essential on these soils. The figures support the visual deficiency symptoms for P and K which were evident on all grass species at various times throughout the year. It has been observed that failure to fertilize after cutting results in very poor regrowth and necrosis probably caused by mineral deficiency.

The second factor affecting pasture growth on the Hattieville soil is the poor vertical and lateral drainage due to an impervious clay subsoil and the flat topography of the land respectively. The soils remain waterlogged for long periods following heavy rains, and raised or cambered beds would be an essential requirement of successful pasture production on these soils.

With fertiliser application at approximately half of the rate used at Hattieville, the Central Farm replication yielded 3 to 7 times the fresh weights of grass obtained at the former site. The yields of the different grass species at Hattieville and Central Farm are contained in Tables 15 and 16 below. The vast difference in yields can be attributed to the high natural fertility and better drainage of the Central Farm soil.

Table 15. Grass species Trial (Hattieville Replication (4) Total Fresh Weight Yield (lb. per Plot from 11 cuts)

Grass Species	Block I	Block II	Block III	Total
Jaragua	76.6	85.1	113.1	274.8
Guinea	118.0	92.0	133.8	343.8
Pasto Rico	46.3	46.3	10.5	103.1
Kazangula	156.4	152.8	166.8	476.0
Hamil	106.0	115.1	166.6	387.7
Pangola	118.5	134.6	130.3	383.4
Carib	100.5	103.6	118.1	322.2

Table 16. Grass Species Trial (Central Farm Replication) Total Fresh Weight Yield (lb. per plot from 16 cuts)

Grass Species	Block I	Block II	Block III	Block IV	Total
Jaragua	465.5	506.0	508.0	427.5	1907.0
Guinea	464.5	439.5	426.0	429.5	1759.5
Gayndah Buffel	361.0	334.5	357.5	324.5	1377.5

Pasto Rico	203.0	201.0	205.5	184.0	793.5
Kazangula	422.5	313.0	326.0	318.5	[illegible]
Hamil	526.5	532.5	576.5	640.0	2275.5
Pangola	296.5	384.5	330.5	350.5	1362.5
Molopo Buffel	406.0	433.0	371.5	469.0	1679.5
Biloela Buffel	456.5	477.0	419.0	423.5	1776.0
Carib	479.5	434.0	424.5	447.5	1785.5
Nunbank	581.0	460.0	453.5	423.5	1918.0

From the figures on yields of fresh grass, the species were divided into four groups as follows:-

Group I - High Performance

Hamil Grass
Nunbank Buffel
Jaragua Grass

Group II - Above Average Performance

Carib Grass
Biloela Buffel
Guinea Grass
Molopo Buffel

Group III - Satisfactory Performance

Kazangula Setaria
Gayndah Buffel
Pangola Grass

Group IV - Low Performance

Pasto Rico (Bermuda).

There were no major pest or disease damage during the year. Rust on Pangola grass and Brown Leaf Spot on Hamil grass were the main diseases evident in the trial plots.

(4) Grass Species Demonstration Plots

All the grass plots planted at the National Agricultural Showgrounds, Belmopan exhibited good growth in 1973. All plots were fertilized once after having been planted and were sprayed with 2,4-D in order to control broadleaf weeds. Best performance is being obtained from Jaragua grass and Hamil grass. Throughout the year, these two grasses have shown good regrowth and maintained a very good stand.

One significant observation was the constant intrusion into all plots by the local Desmodium spp. and Indigofera spp. The heaviest legume populations occurred in the Carib grass and Jaragua grass plots. The Nunbank Buffel, because of its dense stand, apparently smothered legume growth and the growth of weeds as well.

(5) Pasture Maintenance and Development

In an effort to increase the number of grazing days per acre of pasture at Central Farm, several pastures were planted to new grasses and others re-seeded to increase coverage. Less than one half of the total pasture land at Central Farm is planted to improved grass species. The delay in the establishment of the new livestock station at Richmond Hill and the steadily increasing herd size has placed constant stress on these improved pastures, leading to over-grazing and rapid deterioration.

The following grasses were planted at Central Farm in 1973:-

Jaragua	-	73 acres
Guinea	-	55 "
Others	-	48
Total ...		176 acres

Newly-planted grasses were subjected to grazing after 6-8 weeks, which is sooner than the desirable time. This could not be avoided on account of the severe grazing pressure.

Twenty-five acres of forage sorghum (Sudan Grass type) and 60 acres of corn to be used as supplementary feeds were also planted in Central Farm. The forage sorghum was harvested mechanically and fed to the different herds as a green chop straight from the field. This method of supplementary feeding during the dry season has proven beneficial over the past few years.

AGRICULTURAL EXTENSION

(a) Extension Activities

Extension activities included the demonstration of improved cultural practices, distribution of seeds, processing and supervision of loans and assistance to farmers in obtaining mechanical services. The Ministry of Agriculture's Extension Service was organised on a district basis with individual extension officers in charge of a zone within a district. The effectiveness of the Extension Service was felt in the North as many farmers followed the advice of diversifying from cane farming into other agricultural enterprises. Extension tools used included individual contacts with farmers, Extension Committee meetings, method and result demonstrations, radio broadcasts, distribution of pamphlets, field tours, etc. The following is a summary of extension methods used during 1973:-

Extension Visits	4,000
Meetings	100
Method Demonstrations	80
Results	80
Radio Broadcasts	50
Field tours	15

(b) Mechanical Services

The Mechanical Division of the Department of Agriculture offered mechanical services to farmers, in addition to providing these services for the various schemes run by the Department itself. There is a dearth of these services in the private sector and the Department's machinery was unable to cope with the demand. Nevertheless, during the year under review, the following services were rendered:-

Land Clearing	1,265 acres.
Windrowing	282 "
Rome Ploughing	515 "
Bush-hogging	1,610 "
Ploughing	900 "
Planting	447 "
Cultivating	252 "

In addition to the above services, combine harvesting of rice and shelling of corn was also done for several farmers. The Land Clearing

Unit also dug a total of 21 ponds in order to provide farmers with an on-farm supply of water. The Well Rig Unit also dug a total of 8 good wells and started work on 11 others which were later abandoned either because there was no water or because further drilling was not technically feasible.

(c) National Agricultural Show

A very successful National Agricultural Show was held at the Showgrounds in Belmopan on August 4th and 5th. Farmers from all districts participated with a wide variety of crops and livestock exhibits. The Department of Agriculture also exhibited crops and stock. Prizes were awarded to the best exhibits in the respective classes. Agriculture Week was declared open by the Minister of Agriculture one week before the date of the show and during this week various activities and radio talks were scheduled culminating with the show itself.

ACKNOWLEDGEMENTS

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(DENTON E. BELISLE)
for Chief Agricultural Officer

APPENDIX 1

MAIN DISEASES AND PESTS OF CROPS IN BELIZE

Crop	Common Name	Causal Agent
CORN	1. Armyworm	1. Spodoptera frugiperda
	2. Cucumber beetles	2. Diabrotica spp.
	3. Cutworms	3. Spodoptera spp.
	4. Aphids	4. Aphis spp.
	5. Leaf blight	5. Helminthosporium turcicum & H. maydis
	6. Stunt	6. Virus
RICE	1. Armyworm	1. Spodoptera frugiperda
	2. Paddy bugs	2. Mormidia ypsilon & M pictiventris
	3. Brown Leafspot	3. Helminthosporium oryzae
	4. Blast	4. Pyricularia oryzae
BEANS	1. Rust	1. Uromyces phaseoli
	2. Mosiacs	2. Viruses
	3. Crown rot	3. Scelerotium rolfsii
	4. Cucumber beetles	4. Diabrotica spp.
	5. Armyworm	5. Spodoptera frugiperda
	6. Flea beetles	6. Epitrix parvula
	7. Leaf tiers	7. Lamprosema indicata
	8. Cabbage loopers	8. Plusia brassicae
SOYBEAN	1. Cabbage looper	1. Plusia brassicae
	2. Cucumber beetles	2. Diabrotica spp.
	3. Leaf spot	3. Cercospora spp.
	4. Mosiac	4. Virus
SORGHUM	1. Aphids	1. Aphis spp.
	2. Flea beetles	2. Epitrix parvula
	3. Armyworm	3. Spodotera frugiperda
	4. Cucumber beetles	4. Diabrotica spp.
	5. Leaf blight	5. Gleocercospora sorghi
	6. Rust	6. Puccinia sorghi
TOBACCO	1. Hornworm	1. Protparce sexta
	2. Cabbage looper	2. Plusia brassicae
	3. Leaf beetle	3. Systena taeniata
	4. Cutworms	4. Spodoptera spp.
	5. Root knot Nematode	5. Meloidogyne spp.
	6. Blue mold	6. Aspergillus spp.
	7. Black shank	7. Phytophthora parasitica
	8. Leaf spot	8. Cercospora spp.
TOMATO	1. Leaf miner	1.
	2. Cucumber beetles	2. Diabrotica spp.
	3. Fruit worm	3. Heliothis zea
	4. Flea hoppers	4. Halticus bractentus

Crop	Common Name	Causal Agent
	5. Flea beetles	5. Epitrix sp.
	6. Leaf worms	6. Spodoptera spp.
	7. Early blight	7. Alternaria solani
	8. Bacterial wilt	8. Pseudomonas solanacearum
	9. Mosaic	9. Virus
	10. Crown rot	10. Sclerotium rolfsii
COTTON	1. Aphids	1. Aphis sp.
	2. Stainers	2. Dysdercus spp.
	3. White flies	3. Bemisia tabacci
	4. Rust	4. Cerotelium desmium
	5. Mosaic	5. Virus
	6. Leaf spot	6. Cercospora sp.
PEPPER	1. Aphids	1. Aphis spp.
	2. Stink bugs	2. Leptoglossus spp.
	3. Bacterial wilt	3. Pseudomonas solanacearum
	4. Crown rot	4. Sclerotium rolfsii
	5. Mosaic	5. Virus
	6. Leaf spot	6. Cercospora sp.
WATERMELON	1. Aphids	1. Aphis spp.
	2. Cutworms	2. Spodoptera sp.
	3. Root knot Nematode	3. Meloidogyne sp.
	4. Blossom end rot	4. Physiological
	5. Premature fruit drop	5. Physiological
	6. Mosaic	6. Virus
	7. Downy mildew	7. Pseudoperonospora cubensis
CITRUS	1. Mexican Fruit fly	1. Anastrepha ludens
	2. Fruit bugs	2. Edessa sp.
	3. Stink bugs	3. Leptoglossusgonogra
	4. Premature fruit drop	4. Colletotrichum gleosp.
	5. Gummosis	5. Phytophthora parasitica
	6. Psorosis	6. Virus
SQUASH	1. Flea hoppers	1. Halticus sp.
	2. Leaf worm	2. Spodoptera eridani
	3. Vine borer	3. Melitria cucurbitae
CABBAGE	1. Diamond-back moth	1. Plutella xylostella
	2. Cabbage looper	2. Plusia brassicae
	3. Cutworms	3. Spodoptera spp.
	4. Black rot	4. Xanthomonas campestris
	5. Yellows	5. Fusarium Oxysporium

OKRA	1. Aphids	1. Aphis sp.
	2. Leaf Mold	2. Cercospora sp.
CARROTS	1. Root knot	1. Meloidogyne sp.
	2. Blight	2. Alternaria dauci
SUGAR CANE	1. Lace bugs	1. Corythuca fuscigera
	2. Eye spot	2. Leptosphaeria sp.
	3. Borers	3. Diatrea saccharalis
CANNA	1. Rust	1. Puccinia cannae
GROUND CHERRY	1. White rust	1. Albugo Candida
KUDZU	1. Anthracnose	1. Colletotrichum sp.
STYLO	1. Anthracnose	1. Colletotrichum sp.
MANGO	1. Caribbean fruit fly	1. Anastrepha mombinpraeoptans
	2. Fruit piercing moth	2. Gonodonta sp.
	3. Blossom blight	3. Colletotrichum sp.
	4. Algal spot	4. Cephaleuros virescens
	5. Leaf spot	5. Cercospora mangiferae
	6. Thrips	6. Heliothrips rubrocinctus
AVOCADO	1. Fruit Borer	1. Stenoma catenifer
	2. Leaf blight	2. Cercospora purpurea
	3. Root rot	3. Phytophthora cinnamomi
	4. Algal Spot	4. Cephaleuros virescens
CASHEW	1. Thrips	1. Heliothrips rubrocinctus
	2. Leaf spot	2. Cercospora sp.
	3. Algal spot	3. Cephaleuros rubrocinctus
GOLDEN PLUM	1. Gummosis	1. Virus (?)

APPENDIX TABLE 1

MONTHLY RAINFALL AT VARIOUS STATIONS - 1973 (in inches)

STATION / MONTH	LANDIVAR	BELIZE INT'L AIRPORT	AMBERGRIS CAYE CAYE	STANN CREEK AGSTAT	CABBAGE HAUL	AUGUSTINE	COCOA CAIRN	BELIZE FOREST STATION	TOLEDO AGSTAT
January	2.01	2.17	2.47	2.64	3.26	1.80	3.21	1.81	4.18
February	2.52	2.83	1.65	3.67	1.07	2.30	2.60	5.93	1.10
March	0.23	0.30	0.55	1.03	1.76	1.43	2.18	0.98	2.27
April	7.95	6.13	6.50	3.06	3.11	1.60	2.91	5.01	2.79
May	6.50	4.93	6.95	7.48	5.71	3.40	3.40	3.4	2.43
June	0.77	4.99	4.14	4.83	5.32	3.83	4.41	7.23	13.49
July	5.51	9.37	1.91	7.68	11.93	4.18	4.52	14.94	25.06
August	13.42	13.75	9.34	12.01	15.07	5.50	4.80	16.98	24.81
September	13.04	9.97	6.47	14.52	11.22	6.07	4.65	22.38	19.46
October	11.91	12.82	9.13	13.42	14.03	11.42	13.08	22.07	17.91
November	10.30	8.32	8.56	8.50	9.82	8.94	8.08	8.31	8.73
December	3.49	2.91	4.70	1.40	3.00	3.78	2.59	1.36	1.35
ANNUAL TOTAL	77.70	77.69	59.87	75.72	85.07	56.14	56.43	110.09	127.58

APPENDIX TABLE 11

AVERAGE MONTHLY MAXIMUM TEMPERATURES - 1973 (Degrees Fahrenheit)

STATION / MONTH	BELIZE	BELIZE INT'L AIRPORT	AMBERGRIS CAYE	SAVANNAH FOREST STATION	SAVANNAH PAUL	AUGUSTINE	COROZAL	ILLINDA FOREST STATION	B.C.I. LIBERTAD
January	82	82	82	83	83	81	73	87	83
February	82	81	82	86	82	88	74	87	84
March	87	86	85	94	87	91	84	90	90
April	88	88	86	N.A.	88	90	81	93	91
May	88	88	86	96	88	90	84	88	91
June	89	88	86	93	86	89	88	91	92
July	86	88	86	93	85	87	81	91	91
August	88	87	83	93	84	86	80	91	89
September	88	87	87	95	86	87	81	83	90
October	86	85	86	88	85	85	77	90	87
November	85	84	84	87	85	83	74	89	N.A.
December	81	80	80	82	83	80	69	87	82

N. A. = Not available

ANNEX TABLE 111

AVERAGE MONTHLY MINIMUM TEMPERATURES - 1973 (degrees Fahrenheit)

STATION MONTH	[illegible]	BELIZE INT'L AIRPORT	[illegible]	[illegible] FOREST STATION	CABBAGE HAUL	AUGUSTINE	COCKSCOMB BASIN	BELMOPAN FOREST STATION	B.S.I. [illegible]
January	70	70	73	68	72	61	59	71	64
February	68	66	73	67	71	59	60	70	60
March	77	75	75	74	77	67	66	77	69
April	77	75	78	N.A.	77	68	64	78	71
May	79	77	79	75	80	70	67	76	73
June	79	77	79	75	79	69	67	80	73
July	75	76	80	76	79	67	67	79	72
August	76	75	78	75	77	68	67	79	73
September	77	76	77	74	77	68	67	79	73
October	74	73	78	74	75	68	66	77	71
November	74	73	77	73	76	65	64	76	N.A.
December	68	64	70	66	68	58	57	69	58

N.A. = Not Available

SLAUGHTER RETURNS, 1973

AREA	CATTLE			PIGS		
	No.	Dressed Weight (Lb.)	Average Dressed Weight (Lb.)	No.	Dressed Weight (Lb.)	Average Dressed Weight (Lb.)
ozal Town	297	92,275	310.6	207	14,482	69.9
nge Walk wn	541	153,903	284.4	880	87,017	98.8
ize City	3,798	1,165,089	306.8	6,356	371,230	58.4
ize Meat ckers	1,520	609,507	401.0	412	54,765	132.9
Ignacio wn	491	159,422	324.6	840	73,004	86.9
que Veijo wn	61	17,886	293.2	12	871	72.5
n Creek n	162	47,962	296.0	433	25,398	58.6
a Gorda n	40	13,343	333.5	355	28,973	81.6
TOTALS	6,910	2,259,387	326.9	9,495	655,740	69.0

APPENDIX TABLE V

COMPARISON OF AVERAGE BIRTH WEIGHTS OF DIFFERENT CATTLE BREEDS 1972 and 1973

CROSS		Number of Calves		Ave. Birth Wt. (Lb.)	
		1972	1973	1972	1973
Costa Rican x Brahman	F	79	80	57.30	53.01
	M	100	76	59.00	56.02
Costa Rican x Red Poll	F	7	20	56.71	54.05
	M	7	16	60.85	58.01
Costa Rican x Angus	F	3	10	55.33	56.02
	M	9	6	57.44	50.06
Costa Rican x Charalais	F	9	16	61.50	57.02
	M	9	23	60.30	62.00
Costa Rican x Indu Brasil	F	2	4	51.50	65.00
	M	1	9	76.00	67.00
Costa Rican x Brown Swiss	F	5			53.00
	M	5	2	58.60	58.00
All Costa Rican Crosses	F	105	138	57.87	56.00
	M	131	132	59.19	60.16

Note: F denotes female calves, M denotes male calves

APPENDIX TABLE VI

COMPARISON OF AVERAGE WEANING WEIGHTS OF DIFFERENT CATTLE BREEDS 1972 and 1973

CROSS		Number of Calves		Ave. Weaning Wt. (Lb.)	
		1972	1973	1972	1973
Costa Rican x Brahman	F	103	83	333.90	316.60
	M	83	100	364.70	344.90
Costa Rican x Red Poll	F	6	12	353.60	384.80
	M	1	8	333.00	400.80
Costa Rican x Charolais	F	5	18	376.80	406.70
	M	4	11	419.00	456.00
Costa Rican x Angus	F	-	4	-	339.90
	M	2	6	336.50	353.70
Costa Rican x Brown Swiss	F	-	4	-	378.00
	M	2	6	264.00	279.10
Costa Rican x Hereford	F	-	3	-	383.00
	M	-	3	-	370.60
All Costa Rican Crosses	F	116	138	336.09	344.00
	M	95	151	355.00	359.80

Note: F denotes female calves, M denotes male calves

APPENDIX TABLE VII
AVERAGE DAILY GAINS OF PUREBRED FEMALE BRAHMAN CATTLE
CENTRAL FARM, 1973

Identification No.	Birth Weight (Lb.)	Last Weight (Lb.)	Age in Days	Total Gain (Lb.)	Average Daily Gain (Lb.)
2-66	49	444	393	375	1.03
2-176	64	433	356	369	1.04
2-226	58	332	284	276	0.96
2-311	56	385	330	329	0.99
2-328	54	384	310	330	1.06
2-338	56	345	320	299	0.90
2-358	54	438	305	384	1.24
3-91	56	309	292	253	0.87
3-46	46	324	248	278	1.16
3-77	55	422	260	367	1.41
3-81	53	366	296	313	1.05

Overall Average Daily Gain = 1.05 pounds
(Females)
Range - 0.87 to 1.41 pounds

APPENDIX TABLE VIII
AVERAGE DAILY GAINS OF PUREBRED MALE BRAHMAN CATTLE
CENTRAL FARM, 1973

Identification No.	Birth Weight (Lb.)	Last Weight (Lb.)	Age in Days	Total Gain (Lb.)	Average Daily Gain (Lb.)
2-83	50	295	307	245	0.79
2-109	61	357	292	296	1.01
2-86	62	601	516	539	1.04
2-198	59	524	471	465	0.97
2-332	65	557	449	492	1.07
2-241	60	475	412	415	1.01
2-249	59	502	416	443	1.06
2-337	55	470	422	425	1.01
3-29	57	395	315	338	1.07
3-78	52	485	296	433	1.49
3-90	59	496	292	437	1.14

Overall Average Daily Gain, Males = 1.06 lb.
Range 0.79 -- 1.49 lb.

APPENDIX TABLE IX

Average Daily Gain of

Costa Rican Brahman - Male

Numbers	Birth Wt.	Last Wt.	Age in Days	Total Gain (Lb.)	Ave. Daily Gain (Lb.)
3-53	52	434	309	382	1.23
3-62	52	445	305	393	1.28
3-63	58	430	304	372	1.22
3-66	56	412	303	356	1.10
3-71	58	428	300	370	1.23
3-74	51	446	299	395	1.32
3-86	52	430	294	378	1.28
3-94	58	423	290	365	1.25
3-95	60	400	290	340	1.17
2-265	60	548	554	488	.88
2-293	53	412	451	359	.79
2-299	58	516	446	458	1.02
2-342	63	505	416	442	1.06
2-343	59	424	416	365	.87
2-352	52	429	409	377	.92
2-4	50	344	362	294	.81
2-40	68	385	605	317	.52
2-51	64	380	307	316	1.02
2-52	61	355	307	294	.95
2-54	61	455	399	394	.98
2-60	50	475	398	425	1.06
2-68	60	389	298	329	1.10
2-75	56	375	300	319	1.06
2-76	68	455	392	387	.98
2-84	52	460	388	408	1.05
2-116	52	403	282	351	1.24
2-126	69	409	282	340	1.21
2-171	67	460	356	393	1.10
2-199	66	342	342	276	.80
2-205	52	444	338	392	1.15
2-238	59	335	315	256	.81
2-239	52	323	314	271	.86
2-264	62	413	339	351	1.03
2-350	54	388	337	334	.99
2-351	51	368	337	317	.94
2-353	50	335	336	285	.84

Overall Average Daily Gain = 1.03 pound

APPENDIX TABLE X

Average Daily Gain

Costa Rican Brahman - Female

Numbers	Birth Wt.	Last Wt.	Age in Days	Total Gain (Lb.)	Ave. Daily Gain (Lb.)
3-13	51	386	320	335	1.04
3-55	60	400	306	340	1.11
3-18	50	370	287	320	1.11
3-27	46	390	285	344	1.21
3-30	40	341	284	301	1.41
3-41	46	352	281	306	1.09
3-43	43	239	281	196	.70
3-51	49	367	279	318	1.14
3-56	59	351	275	291	1.06
3-64	54	340	272	286	1.05
3-69	49	346	270	297	1.10
2-332	58	371	311	313	1.01
2-334	51	300	306	249	.84
2-339	52	345	301	293	.96
2-356	51	384	273	333	1.18
2-362	52	257	287	205	.72
2-368	56	450	278	294	1.05
2-124	59	275	279	261	.77
2-128	58	300	279	242	.86
2-148	62	337	329	275	.83
2-170	65	285	322	220	.68
2-208	47	300	294	253	.86
2-210	52	280	364	238	.65
2-216	43	336	283	293	1.04
2-220	48	342	351	294	.84
2-236	70	341	445	271	.61
2-237	52	337	346	285	.82
2-252	37	298	313	261	.83
2-254	59	322	325	263	.81
2-263	56	295	371	293	.64
2-274	59	357	359	298	.83
2-284	56	368	362	312	.86
2-288	52	409	361	357	.98
2-289	56	381	360	325	.90
2-306	52	361	344	309	.89
2-310	57	312	344	255	.74
2-312	58	393	344	335	1.03
2-318	55	312	340	257	.75
2-320	59	363	338	304	.89
2-324	52	311	339	258	.76
3-76	49	388	267	338	1.27
3-82	52	364	266	312	1.33
3-85	50	385	263	335	1.29
3-92	46	321	260	275	1.05
3-96	52	390	258	338	1.35
3-105	50	435	255	385	1.51
2-309	64	500	439	460	1.05
2-22	60	401	287	341	1.19
2-25	57	305	314	248	.78
2-26	60	344	405	284	.61
2-28	56	330	311	274	.88
2-29	53	300	311	247	.79
2-34	56	280	313	224	.71
2-41	48	350	314	302	.95
2-49	60	357	309	297	.96
2-50	60	494	365	434	1.19
2-67	57	455	328	398	1.21
2-78	57	452	334	395	1.02
2-80	55	350	359	295	.82

APPENDIX TABLE X

Average Daily Gain

Costa Rican Brahman - Female

Numbers	Birth Wt.	Last Wt.	Age in Days	Total Gain (Lb.)	Ave. Daily Gain (Lb.)
3-13	51	386	320	335	1.04
3-55	60	400	306	340	1.11
3-18	50	370	287	320	1.11
3-27	46	390	285	344	1.21
3-30	40	341	284	301	1.41
3-41	46	352	281	306	1.09
3-43	43	239	281	196	.70
3-51	49	367	279	318	1.14
3-56	59	351	275	291	1.06
3-64	54	340	272	286	1.05
3-69	49	346	270	297	1.10
2-332	58	371	311	313	1.01
2-334	51	300	306	249	.84
2-339	52	345	301	293	.96
2-356	51	384	273	333	1.18
2-362	52	257	287	205	.72
2-368	56	450	278	294	1.05
2-124	59	275	279	261	.77
2-128	58	300	279	242	.86
2-148	62	337	329	275	.83
2-170	65	285	322	220	.68
2-208	47	300	294	253	.86
2-210	52	280	364	238	.65
2-216	43	336	283	293	1.04
2-220	48	342	351	294	.84
2-236	70	341	445	271	.61
2-237	52	337	346	285	.82
2-252	37	298	313	261	.83
2-254	59	322	325	263	.81
2-263	56	295	371	293	.64
2-274	59	357	359	298	.83
2-284	56	368	362	312	.86
2-288	52	409	361	357	.98
2-289	56	381	360	325	.90
2-306	52	361	344	309	.89
2-310	57	312	344	255	.74
2-312	58	393	344	335	1.03
2-318	55	312	340	257	.75
2-320	59	363	338	304	.89
2-324	52	311	339	258	.76
3-76	49	388	267	338	1.27
3-82	52	364	266	312	1.33
3-85	50	385	263	335	1.29
3-92	46	321	260	275	1.05
3-96	52	390	258	338	1.35
3-105	50	435	255	385	1.51
2-309	64	500	439	460	1.05
2-22	60	401	287	341	1.19
2-25	57	305	314	248	.78
2-26	60	344	405	284	.61
2-28	56	330	311	274	.88
2-29	53	300	311	247	.79
2-34	56	280	313	224	.71
2-41	48	350	314	302	.95
2-49	60	357	309	297	.96
2-50	60	494	365	434	1.19
2-67	57	455	328	398	1.21
2-78	57	452	334	395	1.02
2-80	55	350	359	295	.82

APPENDIX TABLE X Cont'd

Numbers	Birth Wt.	Last wt.	Age in days	Total Gain (lb)	Ave. Daily Gain (lb)
2-111	61 lb.	400	337	339	1.01
2-123	60 "	355	339	295	.91

Overall Average Daily Gain = 0.9[illegible] lb

Range = 0.61 to 1.51 lb.

APPENDIX XI

COMPARISON OF AVE. WEANING WEIGHTS OF DIFFERENT CATTLE BREEDS

CENTRAL FARM, 1971 - 1973

BREED		NUMBER OF CALVES			AV. WEANING WEIGHT (lb)		
		1971	1972	1973	1971	1972	1973
CROSS BRAHMAN	F	15	103	138	386.60	333.90	344.00
	M	43	83	151	453.50	364.70	359.80
PURE RED POLL	F	8	30	17	432.90	373.20	383.00
	M	16	20	15	454.20	425.90	410.30
PURE BRAHMAN	F	3	16	15	410.00	365.00	362.60
	M	8	15	20	423.60	397.70	397.50
PURE BROWN SWISS	F	1	10	6	310.00	283.30	340.50
	M	4	9	5	378.50	347.20	334.40
PURE HEREFORD	F	-	-	7	-	-	189.80
	M	-	2	1	-	321.00	300.00

Average Weaning Wt. For All Females, 1973 = 344.00 lb
" " " " " Males, 1973 = 364.30 lb
" " " " " Calves, 1973 = 359.30 lb.
Range For Female Calves (1973) 121.00 to 541.00 lb.
" " Male " " 210.00 to 670.00 lb.

Note: F denotes female calves, M denotes male calves.

APPENDIX TABLE XII

Breed		No. Farrowed	No. Weaned	Av. Weaning Weight
Landrace				
#3		11	11	32.8
#5		9	6	35.2
L. A. - 1		8	(Dam & Piglets died at parturition)	
#3		10	9	32.2
#8		2	2	28.0
#9		7 (Not weaned yet)		
		47	28	128.2
Duroc				
#20		10	7	22.7
#8		11	8	29.6
#10 - 25		10	10	29.8
A - 1		6	4	29.0
A - 1		11 (Not weaned yet)		
		48	29	111.1
Large White				
#10		9	9	23.5
C - 11		7	7	39.0
		16	16	62.5
Sows	Boars			
Duroc #10	L/White	11	11	24.0
Dam. #7	Duroc	5	5	48.3
Dam. H.C.3	L/White	9	7	35.3
Dam. A.I.	L/White	9	6	30.0
Dam. A.I.	L/White	12	(Not weaned yet)	
Dam. H.C. 3	L/ WHITE	6	4	29.0
		52	33	166.9

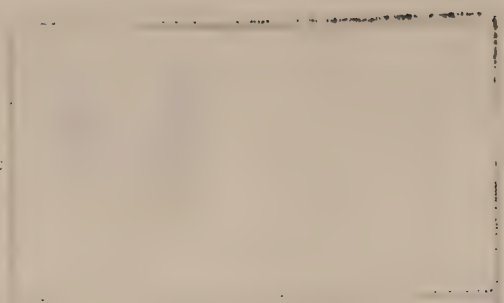
APPENDIX TABLE XIII

Breed	No. of Litters	Average No. of Pigs Born per Litter	Average No. of Pigs Weaned per Litter	Total Lbs. of Meat Weaned	Average Weaning Weight per Litter
Large White	2	8	8	249.6	31.2
Landrace	6	8	7	224	32.0
Duroc	5	9	7	193.9	27.7
Different Crosses	6	9	7	233.8	33.4

Breed	Year	No. of Litter	Average No. of Pigs Born per Litter	Average No. of Pigs Weaned/Litter	Average Weaning Weight per Litter
Large White	1970	11	11	9	26.7 lbs.
	1971	7	10	7	26.7 "
	1972	6	10	7	34.1 "
	1973	2	8	8	31.2 "
Landrace	1972	1	9	6	30.2 "
	1973	6	8	7	32.0 "
Duroc	1970	6	11	9	28.9 "
	1971	10	9	7	26.6 "
	1972	7	9	7	28.9 "
	1973	5	9	7	27.7 "
Different Crosses	1970	3	8	7	26.3 "
	1971	4	8	7	34.3 "
	1972	16	9	7	31.5 "
	1973	6	9	7	33.4 "

APPENDIX TABLE XIII Cont'd

Breed	Year	No. of Litter	Av. No. of Pigs Born per Litter	Av. No. of Pigs Weaned per Litter	Average Weaning Weight per Litter
Hampshire	1970	5	9	8	30.3
	1971	2	8	8	34.2
	1972)				
	.....	.....No Boar available			
	1973)				



APPENDIX TABLE XIV

CLINICAL CASES, 1973

SPECIFIC INFECTIOUS DISEASE :	CATTLE	HORSE	PIG	SHEEP	DOG	CAT	POULTRY
(a) Vesicular Stomatitis	253	61	1				
Distemper					95		
Leucosis							99
(b) Leptospirosis					19		
Colibacillosis	3						
Fowl Cholera							120
Blackleg	98						
(c) Anaplasmosis	46						
Coccidiosis	7						649
DIGESTIVE TRACT							
Non-specific Enteritis	7		26	14	50	4	
Calf Diptheria	1						
Lampas		1					
Gastritis	1				5	1	
Bloat	1	1					
Choke	2						
Indigestion			2				
Septicaemia	1		2				
Abdominal Hernia			2				
Constipation			1		2		
URO - GENITAL TRACT :							
Dystocia	3			2	1		
Abortion	2			2			
Retained Placenta	17	2		2			
Metritis	4		4				
Vaginitis					1		
Mastitis	18		2				
Crushed Piglets			10				
Pregnancy Diagnosis	368	3					
Urinary Calculae			1				
Prostatitis					2		
Prepuce Infection	6						
Castrations	37	11	87		16	1	
Castration Wound Infection	1						
Scrotal Hernia			5				
RESPIRATORY TRACT							
Pneumonia	21	2	15	13	2		
Respiratory Infection	7	2	5		2		
Rhinitis	6		1		2		
Sinusitis	4						
Brocnhitis					1		
Lungworm	90						

Cont'd...

APPENDIX TABLE XIV Cont'd.

CLINICAL CASES, 1973

	CATTLE	HORSE	PIG	SHEEP	DOG	CAT	POULTRY
E SKIN AND APPENDAGES :							
Myiasis	28	3	4		7	4	
Infectious Papilloma	6						
Photosensitisation	10						
Ear Infection	2				23	1	
Swollen Lip			1				
Eye Infection	2				17	3	
Coronitis		1					
Hoof-Sand Crack	2						
Dehorn	2						
Trauma	7	3	16		20		
Dermatitis						1	
Mange	6		1	25	1		
F LOCOMOTOR :							
Obturator Paralysis	1						
Joint Ill	2	2					
Tendonitis	2	2			2		
Foot Rot	8						
G PARASITIC :							
Ectoparasites	63	15			93	1	100
Endoparasites	233	36	132	37	209	6	3
Mansons Eye Worm							128
Screw-worm	1	1					
H DEFICIENCY:							
Piglet Anaemia			6				
I MISCELLANEOUS :							
Plant Poisoning	45						
Aldrin Poisoning	1						
Non-specific Poisoning					5	5	
Abscess	6	6	1		1		
Oedema			1				
Epilepsy					1		
Hypoglycaemia			13				
Malnutrition	5			1			
Heat Stroke			1				
Surgery			1		14	1	
Other Cases	103	64	209	30	188	2	114
Hordoleum					1		
Total Clinical Cases	1,513	216	550	126	780	30	1,213

APPENDIX TABLE XIV Cont'd

CLINICAL CASES, 1973

	CATTLE	HORSE	PIG	SHEEP	DOG	CAT	POULTRY
J VACCINATIONS :							
Rabies					112		
Distemper Hepatitis					52		
Leptospirosis					90		
Lungworm	88						
Swine Fever			26				
Blackleg	14,274	166		97			
K POST MORTEMS :							
CAUSE							
Malnutrition	4			1			
Pneumonia	6	1	8				
Ulcerated Stomach	2						
Blackleg	95						
Septicaemia			2				
Severe Internal Parasitism	1						1
Coccidiosis							7
Leukosis							6
Anaplasmosis	7						
Fowl Cholera							89
Choke	1			1			
Colibacillosis	1						
Toxicosis			1				
Grand Total	16,018	383	587	225	1,034	30	1,316

APPENDIX TABLE XV

DISEASES FOUND AT MEAT INSPECTION, 1973

	CATTLE	PIGS	SHEEP
A TOTAL CARCASES CONDEMNED			
Mastitis (Acute, Septic)	3		
Tuberculosis	4	37	
Metritis (Acute, Septic)	2	1	
Septicaemia	6	4	1
Oedema	66	50	
Actinobacillosis	1	2	
Actinomycosis	2		
TOTAL -	84	94	1
B LUNGS CONDEMNED (lbs. wt.)			
Pneumonia	171	16	
Necrosis	992	2165	
Contamination	101	46	
Imperfect Bleeding	316	477	
Lungworm	29	3	
Emphysema	97	8	
TOTAL -	1706 lb. wt.	2715 lbs. wt.	
C LIVERS CONDEMNED (lbs. wt.)			
Necrosis	34	156	
Contamination	1		
Telangiectasis	128	134	
Cirrhosis	177	2249	
Fluke			15
Abscesses	75	412	
Melanosis		2	
Cystic	1	1	
	416 lbs. wt.	2954 lbs. wt.	15 lbs. wt.
D WHOLE KIDNEYS CONDEMNED			
Hydronephrosis	440	335	
Steph. Dentatus		4488	
	440	4823	
E CASES OF PARASITIC INFECTION			
Ascaris Lumbricoides	(Neoas-caris) 24	2140	
Oesophagostomum Radiatum	212		
Steph. Dentatus		4488	
Cysticercosis		60	
Liver Fluke			3
Lungworm	16	2761	
Other Worms	3	543	
Lungs		8	
	255 Cases	10,000 Cases	3 Cases

Cont'd....

APPENDIX TABLE XV Cont'd

DISEASES FOUND AT MEAT INSPECTION, 1973

F OTHER PARTS CONDEMNED (lbs. wt.)	CATTLE	PIGS	SHEEP
Tumours	20	372	
Localised TB.		8	
Brusing	243	307	
Enteritis	111	64	
Melanosis	29	175	
Mastitis	2		
Pericarditis	15	2	
Local Necrosis	2	46	
	422 lbs wt.	974 lbs. wt.	

SUMMARY.

Total Carcase Condemned	84	94	1
lbs.wt. of lung	1706	2715	
lbs.wt. of liver	416	2954	15
Whole Kidneys	440	4823	
Other parts (lbs.wt.)	422	974	